DEPARTMENT OF ENVIRONMENTAL QUALITY
LAND QUALITY DIVISION

GUIDELINE NO. 3

RADIOLOGICAL SURVEY

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This document is a guideline only. Its contents are not to be interpreted by the applicant or DEQ staff as mandatory. Its preparation is the result of numerous requests from applicants who have expressed a need for a check-list to assist them in preparation of a comprehensive application containing all required information.

I. OBJECTIVES

The objectives of the baseline radiological survey and sampling are to:

1. Establish the nature of the pre-mining radiological environment.

2. Detect and document areas having anomalous radiation.

3. Establish pre-mining concentrations of radio nuclides in the surface materials of the lands to be affected in order to establish a goal for reclamation.

II. GAMMA SURVEY METHODS

The gamma survey should be used to determine the pre-mining radiological environment. The following methods are recommended.

1. The survey should be conducted using a grid system where readings are recorded at no greater than 500 foot intervals. Pacing of these distances is sufficient.

2. The survey should also consist of a "scan-method" where readings are noted between the 500 foot intervals. In this way radiological anomalies will be detected. If such anomalies are found, they should be precisely defined as to location and extent.

3. Readings should be taken with a scintillometer or similar device held approximately three feet above the ground.

4. Results of the survey should be plotted and isopleths constructed on a pre-mining topographic map of the survey area. See mapping requirements in Guideline 6. The survey grid should be aligned with key control points to assure similar results if the survey is repeated.

NOTE: Ideally, pressurized ionization chambers (PIC) should be used while making gamma-ray exposure measurements because accurate gamma measurements cannot be obtained with a poorly calibrated scintillator survey meter. To assure reproducibility of the scintillometer readings, the instrument should be carefully calibrated and periodically cross-checked with a PIC. Gamma measurements should be made during

normal dry weather and not following rainfall or when the soil is wet or frozen. While taking readings, the instrument should be held out away from the body. A double reading technique, i.e., shielded versus unshielded, may be necessary in areas where shine from mine wastes or tailings piles may presents a localized gamma source. The radioactive material or radiation intensity used to calibrate the survey instrument should be noted in the application.

III. SOIL SAMPLING TECHNIQUES

Soil sampling and analysis should be conducted to determine the premining radio nuclide concentrations in order to develop a reclamation plan to be consistent with reclamation standards. Recommended techniques are as follows.

1. Using the gamma survey, affected land should be broken up into areas of relatively similar activity.

2. Soil and bedrock material of each similar area should be sampled by not less than ten auger holes to a depth of six feet. All material from the 10 auger holes should be thoroughly mixed and an aliquot of the composited samples taken for laboratory analysis. The 10 soil sample locations should be randomly selected. Soil sample locations forming each composite sample should be noted on the gamma survey map.

   NOTE: Down-the-hole gamma logging may function as an alternative means of establishing background in the surface six feet of the soil and bedrock material. However, before this method can be acceptably used in place of soil sample collection for quantitative analysis, the operator must develop an acceptable calibration curve which is based on actual concentrations in the soil.